Waste water not wasted: the Western Treatment Plant as a habitat for waterfowl

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Abstract
The Western Treatment Plant (WTP) is an outstanding example of a case where the waste water from a large city (Melbourne) is used to provide habitat for waterfowl and other birds. This paper provides a brief summary of the results of monitoring waterfowl numbers over 12 years, documenting the high numbers of many waterfowl species that the WTP supports (often >100 000 birds in total). Active and adaptive management by Melbourne Water based on ongoing monitoring strives to maintain WTP's value for waterfowl. (*The Victorian Naturalist* **131** (4) 2014, 147-149)

Keywords:

Introduction

Melbourne is a city of >4 million people and uses a lot of water (360 billion litres in 2011-12, http://www.melbournewater.com.au/waterdata). After use, the water is treated to remove harmful contaminants, and re-used for specific purposes or released to the sea. More than half this waste water is treated at the Western Treatment Plant (WTP) near Werribee where more than 40 billion litres of recycled water is produced per year (http://www. melbournewater.com.au/whatwedo/treatsewage/wtp/Pages/western-treatment-plant.aspx - accessed 14/3/2014). The WTP provides valuable habitat for waterfowl, and is a centrepiece of a Ramsar-listed wetland of international importance: Port Phillip Bay (western shoreline) and the Bellarine Peninsula. Hence Melbourne Water needs to manage the WTP to conserve waterfowl as well as to treat waste water. Since 2000, this has involved a program to monitor waterbirds. This was initiated by Melbourne Water as part of an Environment Improvement Program (EIP, 2003-05), designed to reduce nutrient inputs to Port Phillip Bay and meet requirements set by the Environment Protection Authority. The EIP involved phasing out land-based treatment processes in favour of ponding; intensifying treatment on two modernised lagoon systems and ceasing to use certain lagoons including Lake Borrie for sewage treatment. As this could affect Ramsar values (positively or negatively), the EIP became a controlled action under the Australian Government's *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). It was approved subject to continued monitoring and adaptive management. The adaptive management has many aspects, including creation and management of conservation ponds and a major capital works program to return nutrient-rich sewage to Lake Borrie through a new pipeline (Steele and Harrow 2014).

Waterfowl numbers have been counted across the whole WTP at two-monthly intervals as part of the monitoring program (Loyn *et al.* 2014). This paper uses that dataset as a case study to illustrate the value of using waste water in this way to provide habitat for waterfowl. The data are being analysed further to reveal how chemical, physical and climatic variables interact to influence the use of habitat by waterfowl, to inform future management. Here we define waterfowl as ducks, geese and swans (Anatidae) along with other birds that typically feed while swimming (grebes and coot). These species are also monitored more widely in Victoria through a Summer Waterbird Count (Loyn 1991; Murray *et al.* 2012; Purdey and Loyn 2012). This paper focuses on describing the numbers of waterfowl that use the WTP, making comparisons to numbers elsewhere in Victoria to show how the waste water is not wasted, but re-used to provide important habitat for these birds.

We note that the WTP also provides very valuable habitat for waders (shorebirds), cormorants, ibis and other birds, which are subject to parallel studies (Loyn *et al.* 2014).

Methods

Waterfowl were counted (by species) across the entire WTP six times per year from 2000 to the present. A single observer (RJS) conducted these counts after initial tests for observer variation. Notes were made on breeding activity when observed. Data were recorded separately for every discrete wetland at the WTP, including individual treatment ponds. However, this short paper just focuses on the total counts, presenting mean and maximum numbers of each species observed across the whole WTP from 2000 to 2012. We also show how we classified waterfowl into feeding guilds, which will be used for subsequent analyses.

Results

Waterfowl species are shown in Table 1, along with the guilds to which they have been assigned and their breeding status at the WTP. Mean and maximum counts of each species at the WTP are shown in Table 2. Maximum counts greatly exceed the means, reflecting marked variation between seasons and years (Loyn *et al.* 2014). Counts of waterfowl across all species exceeded 100 000 in many years.

Breeding was recorded frequently for Black Swan *Cygnus atratus*, Cape Barren Goose *Cereopsis novaehollandiae* and Chestnut Teal *Anas castanea*, less often for Pacific Black Duck *Anas superciliosa* and rarely for other species. Large numbers of Chestnut Teal bred successfully every year in nest boxes provided on one of the treatment ponds, Lake Borrie pond 9 (E Walker pers. comm.).

Discussion

Total counts of waterfowl on the WTP often constituted a large proportion (40-80%) of the totals recorded across Victoria on the Summer Waterbird Count for the same years (DEPI unpublished data), and ~70% of the total recorded during aerial surveys of Victoria in one year (2008) when an attempt was made to make a comprehensive aerial count (R Kingsford pers. comm.).

Several species were frequently present in higher numbers at the WTP than at other wetlands counted in the annual Summer Waterbird Count (DEPI unpublished data; e.g. Purdey and Loyn 2012). These included two of the filter-feeding ducks (Pink-eared Duck *Malacorhynchus membranaceus* and Australasian Shoveler *Anas rhynchotis*), two of the diving ducks (Blue-billed Duck *Oxyura australis* and Musk Duck *Biziura lobata*) and a grebe (Hoary-headed Grebe). Blue-billed Duck exceeded 12 000 on one occasion, equivalent to what was then believed to be the global population (Garnett and Crowley 2000). Counts of Australian Shelduck *Tadorna tadornoides* often exceeded those at other wetlands, except in early years when even larger numbers congregated in the large saline wetlands of south-western Victoria.

One species (Australian Wood Duck *Chenonetta jubata*) that is very common on farm dams and freshwater wetlands was remarkably scarce at the WTP, probably because it is sensitive to salinity (Loyn *et al.* 2006). Waterfowl that occur commonly on a wide range of Victorian wetlands (e.g. Pacific Black Duck, Grey Teal and Black Swan) (Kingsford *et al.* 1999; Marchant and Higgins 1990; Murray *et al.* 2013) were well represented at the WTP, but numbers did not typically exceed numbers on certain wetlands elsewhere.

Clearly the WTP provides important habitat for very large numbers of waterfowl of many species. Its special contribution is as non-breeding habitat and drought refuge for filter-feeding ducks, diving ducks, Australian Shelduck and Hoary-headed Grebe, but it is used (to varying degrees) by all species. Waste water treatment plants elsewhere can also be valuable (Murray and Hamilton 2010; Murray *et al.* 2013) but to a much lesser extent because they are usually small and not actively managed for waterfowl. Sympathetic management of the WTP by Melbourne Water, including the provision of partially treated water in redundant treatment ponds with the aim of maintaining or enhancing waterfowl habitat quality, has made an important contribution to conserving waterfowl, especially at times of drought when there are limited amounts of habitat for them in this corner of Australia. Our waste water has not been wasted at all.

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Table 1. Waterfowl recorded at the Western treatment Plant 2000-2012, along with the feeding guilds to which they have been assigned and their breeding status at the WTP. # B=breeds regularly at WTP; NB=non-breeding visitor; RB=rarely breeds at WTP; V=vagrant

Species	Scientific name	Guild	Breeding status #
Magpie Goose	*Anseranas semipalmata*	Goose	V, RB
Musk Duck	*Biziura lobata*	Diving duck	RB
Freckled Duck	*Stictonetta naevosa*	Filter-feeding duck	NB
Cape Barren Goose	*Cereopsis novaehollandiae*	Goose	B
Domestic Goose	*Anser sp.*	Goose	V
Black Swan	*Cygnus atratus*	Swan	B
Australian Shelduck	*Tadorna tadornoides*	Grazing duck	RB
Australian Wood Duck	*Chenonetta jubata*	Grazing duck	NB
Pink-eared Duck	*Malacorhynchus membranaceus*	Filter-feeding duck	RB
Australasian Shoveler	*Anas rhynchotis*	Filter-feeding duck	RB
Northern Shoveler	*Anas clypeata*	Filter-feeding duck	V
Grey Teal	*Anas gracilis*	Dabbling duck	RB
Chestnut Teal	*Anas castanea*	Dabbling duck	B
Mallard	*Anas platyrhynchos*	Dabbling duck	V
Pacific Black Duck	*Anas superciliosa*	Dabbling duck	B
Hardhead	*Aythya australis*	Diving duck	NB
Blue-billed Duck	*Oxyura australis*	Diving duck	RB

Table 2. Mean, standard error and maximum counts of waterfowl species recorded at the Western Treatment Plant 2000-2012 (n=73).

Species	Mean	SE	Max
Magpie Goose	<1	<1	11
Musk Duck	1005	68	2103
Freckled Duck	65	14	554
Cape Barren Goose	14	2.2	65
Domestic Goose	<1	<1	2
Black Swan	2977	195	6879
Australian Shelduck	5623	1046	34922
Australian Wood Duck	8	1.8	109
Pink-eared Duck	12419	1517	50991
Australasian Shoveler	3759	449	17433
Northern Shoveler	<1	<1	1
Grey Teal	3651	279	12466
Chestnut Teal	3578	295	10914
Mallard or Domestic Duck	<1	<1	2
Pacific Black Duck	1001	80	3148
Hardhead	3429	402	15518
Blue-billed Duck	4078	402	12178

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